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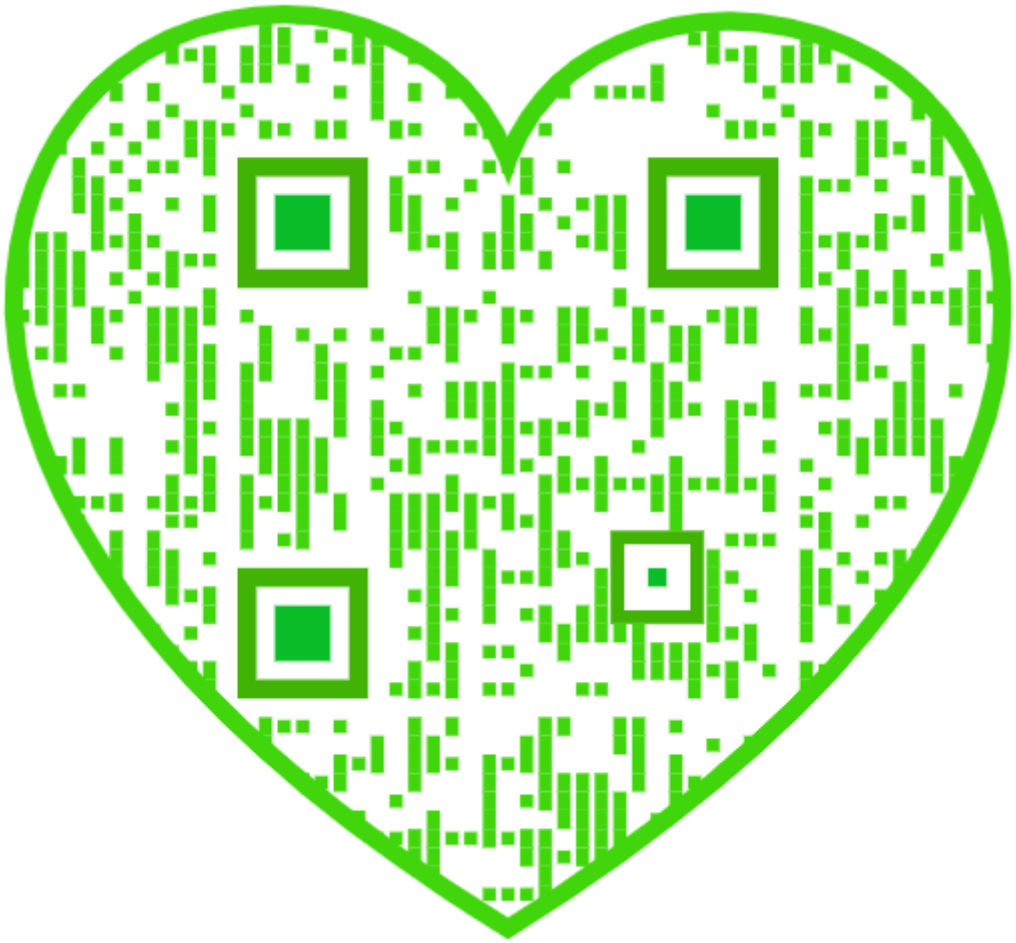

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CIRCULAR NO. 69

ELEMENTS OF BEEKEEPING

By H. R. NISWONGER

March, 1919

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FOREWORD

Almost every community has some beekeepers. For the city man and woman it is often a source of recreation and with the farmer it is more of a side line. In many instances, the business side is lost sight of and the financial returns are not paying for the time and money invested. On the other hand, there are those who keep bees in a large way, where every detail in management is worked out, and results are obtained equal to those derived from other lines of agriculture.

To succeed either in a small or large way one should select some successful beekeeper in his community and learn from him the methods adapted to that particular locality.

The beekeeping industry is taking on a new life, extension work along this line is being enlarged, better methods are being adopted, and with larger production has come better markets and higher prices.

The purpose of this publication is to assist the beekeeper who has handled bees in a small way and has not been very successful on account of the lack of definite information concerning some of the more practical methods.

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ELEMENTS OF BEEKEEPING

By H. R. NISWONGER

Beekeeping, as a rule, is not undertaken as a sole occupation, but is usually carried on as a pleasure and a means of obtaining a natural product which only the honey bee can produce. There are, however, in many sections of Kentucky beekeepers who make a good living by devoting all their time to the production of honey.

It may be said safely that any locality where farming, gardening or fruit growing is followed, is also adapted to the keeping of bees. The mountain sections of this State afford excellent opportunities for beekeeping, on account of the natural growth of wild plants and native forest trees.

Bees are not only profitable as honey producers, but are also of great value to the orchardist and gardener as cross-pollenizers of many fruits and vegetables, thereby increasing their productiveness.

It is desirable to start with a few colonies and to make the bees pay for themselves; then to buy additional equipment and gradually enlarge the apiary. There are many beekeepers who possess only a few colonies and often these are left to shift for themselves, but if they were rightly managed they could be made a paying investment, considering the amount of capital and time expended.

Equipment

Hive. It is not profitable to keep bees in boxes, nail kegs, or hollow logs, since it is impossible to learn the condition of the bees. The wax moth and bee diseases lurk in these old-fashioned bee houses. Much of the surplus honey is lost because swarming cannot be controlled and, in the honey that is secured, there is often found bee-bread and young brood. There is a great

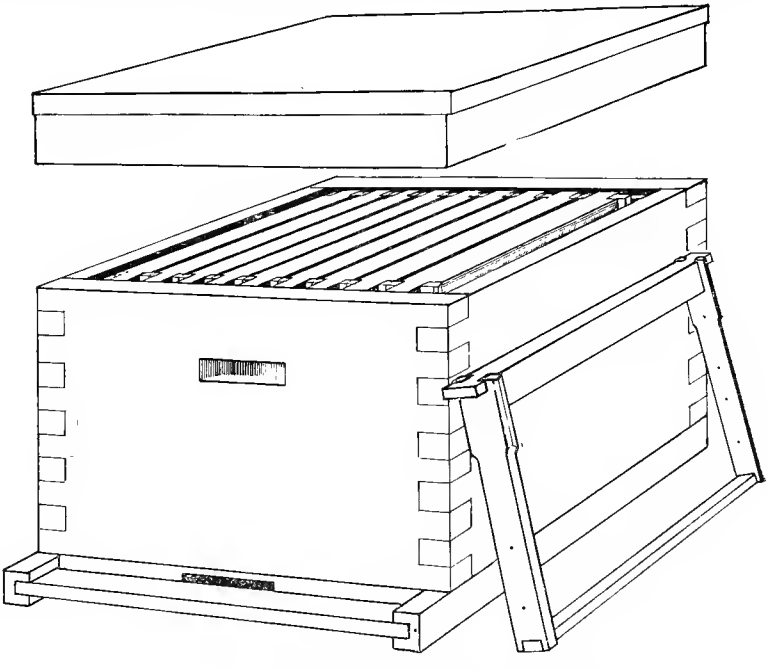

Fig. 1—A 10-frame Langstroth hive with metal cover.

annual loss in bees, due to insufficient amount of stores, as there is no way of examining the colony in regard to the quantity of honey needed by the bees.

On the other hand, where the movable-frame hives are used, the bees can be examined by lifting out the frames of comb to see whether there is plenty of brood or whether disease is present. A larger yield of honey is secured because swarming can be controlled to a certain extent and larger colonies built

up. The type of hive adopted as the standard and used by the best beekeepers is the Langstroth which may be obtained from any reliable dealer in beekeepers' supplies. The Langstroth hive is a dovetailed box with top and bottom and contains eight or ten movable frames. These frames contain comb foundation (thin sheets of beeswax with impressions of the base of worker cells and are equally spaced so there is just room enough for the bees to pass between them. This hive body is called the brood-chamber; here the eggs are laid, the young bees are reared and honey for the colony is stored.

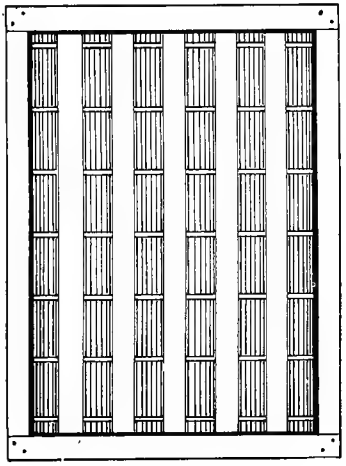

Fig. 2—Queen-excluder.

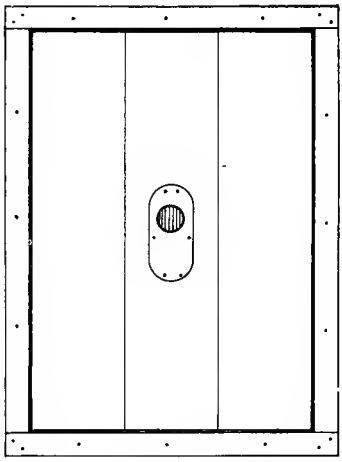

Fig. 3—Bee-escape and board.

Supers. The super, commonly called the "cap" by beekeepers who still use the box-hive and tree "gum," is a box which is placed on top of the brood-chamber, for the storage of surplus honey. There are two kinds; the section super, containing wooden sections and used in the production of box honey, and the shallow extracting-super containing frames similar to those of the brood-chamber, only much shallower, and used either in the production of "chunk" or bulk comb-honey or extracted or "strained" honey. Many of the larger apiarists use extra

brood-chambers along with shallow extracting-supers, in the production of extracted honey.

Queen-Excluder. The queen-excluder, made of wood and wire, with openings between the wire just large enough to permit the passage of worker bees, but too narrow to admit the queen, is placed between the brood-chamber and super and prevents the queen from going up into the super and placing eggs in the combs containing the surplus honey. It is used largely in the production of chunk and extracted honey.

Bee-Escape and Board. The bee-escape and board is placed between the hive and super when the honey is ready to be taken off. It frees the supers from bees so that no shaking of the frames or smoking of bees is necessary. It is put on late in the evening before the day when the super is to be taken off. The board, with the bee-escape removed and a small piece of wood tacked over the hole, is used as an inner cover and remains on the hive the year around; during the summer it is placed between the top super and the hive cover.

Kind of Bees. The Italian bees are considered the most profitable and are very popular among the beekeepers in this country. They are vigorous workers, gentle to handle, keep their hives clean and withstand foul-brood and the bee moth better than some of the other races of bees.

Suggested Outfit for Beginners

Bulk Comb-Honey Production. One colony of Italian bees in a 10-frame Langstroth hive with frames containing full sheets of medium brood foundation,

Two shallow extracting-supers complete, with narrow strips of thin super foundation,

Queen-excluder,

One Porter bee-escape and board,

Hive tool,

Bee veil,

Standard smoker,

Spool No. 30 tinned wire for wiring comb foundation in the brood frames.

The beekeeper will find it to his advantage to buy the hives and supers knocked down and assemble them himself. It does not pay one to make his own hives, as the factory-made ones are of good material and made with greater accuracy. Many beekeepers make the hive body and then buy the frames in the flat.

The Colony. A colony of bees consists of about 25,000 or more individuals and is made up of one queen and thousands of workers who build the comb, gather the stores, keep the hive clean and feed the colony. During part of the year there are

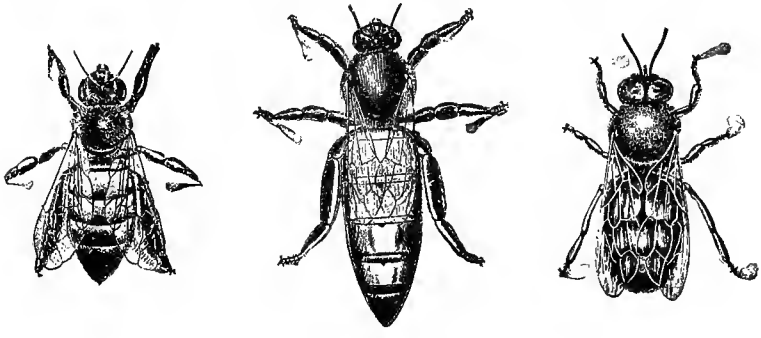

Fig. 4

Worker Queen Drone

present, in small numbers, male bees, called drones, whose sole purpose is to mate with the queen. A large swarm constitutes a colony. A small lot of bees, numbering about 5,000 or more, makes a nucleus.

How to Get Bees. Nuclei may be purchased or colonies in movable-frame hives. If full and strong colonies are obtained early in the spring, returns from the sale of the honey will often pay for the investment. It is always advisable to obtain colonies from someone in your own locality. In starting with a nucleus it is necessary to purchase a one to three-pound package (about 5,000 to 15,000 bees) with a good queen. By fall

a full-sized colony will be built and if there is a good honey-flow at that season of the year, one may expect some surplus honey.

Transferring to Movable-Frame Hives. When bees have been purchased in box-hives, it is necessary to transfer them to the movable-frame hive. This may be done by the following method: Set the box-hive aside and put in its place the new hive, filled with frames containing full sheets of foundation. Smoke the bees thoroly and knock the box to pieces, first removing one side. Cut out the combs and shake the bees upon a piece of canvas or a sheet of newspaper, in front of the entrance of the new hive. It is very important that the queen be with the bees. The queen and the bees will then crawl into the new hive and begin working just as a new swarm. The old combs, if crowded or diseased should be melted up and the honey and wax used. If no disease is present, the comb containing brood and honey may be cut to fit the frames of the new hive and held in place by strings or rubber bands. This will save the bees the delay of having to build new combs. Transfers can be made as early as fruit blooming period, selecting a warm day for the work. If this transfer is made at the time when there is a scarcity of honey flow and the new hive contains only frames of foundation, the bees should be fed a thin sugar syrup made by dissolving sugar in warm water, two parts of water to one of sugar.

Importance of Good Queens. Success in honey production, swarm control and wintering depends upon young and vigorous queens. Queens may be purchased from beekeepers who make a specialty in queen raising. For general purposes, the "untested" queens are usually satisfactory and directions for the introduction of the queens are printed on the mailing cases used in sending them. A common practis among beekeepers is to re-queen every two years, from the best colony in the apiary. This can be done by transferring a frame of brood containing ripe queen-cells from the best colony to the one to be re-queened, first making the colony queenless, twenty-four hours before giving the ripe queen-cells.

Location of Apiary. Bees thrive best in the open but in a

place which is sheltered from the prevailing winds. The matter of sun and shade is of considerable importance and bees seem to work better where they can get the morning sun but where the hives are shaded in the afternoon. Elevate the hive above the ground to keep out intruding pests and to avoid dampness. The space in front of the hive should be kept clean of weeds and tall grass, since these hinder the bees in their work.

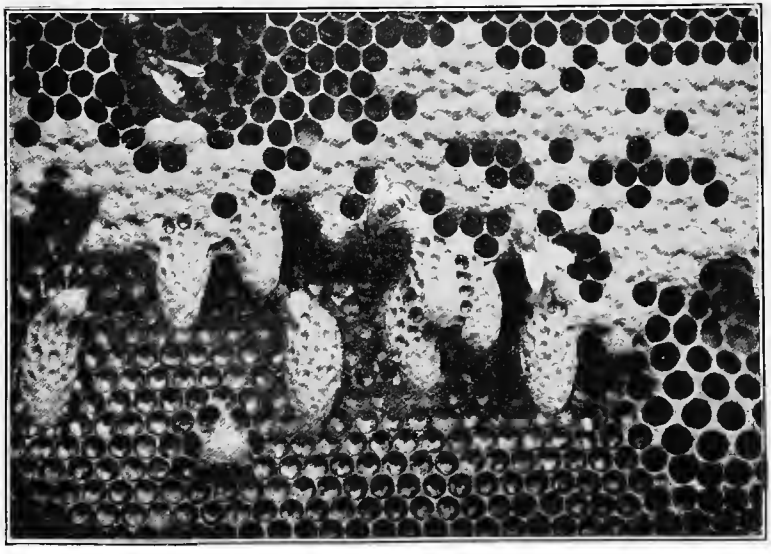

Fig. 5—Brood comb, showing open and capped cells. The large, peanut-shaped objects are queen cells. Of the open cells, the larger ones, near the lower, right-hand corner, are drone cells; the others are worker cells. (By courtesy of the Connecticut Experiment Station.)

Surplus Honey. At the start, one should confine himself to the production of "chunk" honey, since it requires less labor and skill than the production of box or section honey. After successfully handling a few colonies and as the equipment enlarges enough to warrant the addition of an extractor, one should gradually work into the production of extracted honey. In preparing for "chunk" honey, two or more shallow extracting-supers with frames containing narrow strips of thin super

foundation, in addition to each hive, should be on hand at the beginning of the honey flow. The number required for each colony depends on the strength and duration of the honey flow. In storing the surplus honey the bees draw out the foundation and fill the frames with comb honey. This is cut out by the beekeeper and, with some strained honey added, is sold in the bulk as "chunk" honey.

To produce extracted honey either the shallow extracting-supers or extra brood-chambers may be used. Full sheets of comb foundation are put into the frames and wired to prevent the tearing down of the comb in the process of extracting. In a ten-frame super or hive body nine frames are used and in an eight-frame, seven. This results in thick, full combs that are more easily uncapped. The supers are taken off when about two-thirds of the cells are capped, placed in an extracting machine and the honey thrown out of the cells. The combs of empty cells are then put back into the hives, to be cleaned up or to be refilled by the bees, provided the flow is still on. Some prefer the shallow extracting-supers, as they are filled and the cells capped more rapidly than in the full-depth frames. Honey from uncapped cells is usually not ripened and such honey often ferments, when kept for some time.

When the brood-chamber becomes crowded with bees and the combs begin to show white at the top of the frames, the supers should be put on. The second super should be added underneath the first as soon as the bees start capping the cells in the latter.

General Management

The beekeeper's skill in securing a large production of honey depends on (1) Spring management, in having a large force of worker bees, strong enough to work in the supers at the beginning of the honey flow; (2) Swarm control, by keeping the working force intact and at work during the entire honey flow.

Spring Management. If the colony has come thru the winter with a small percentage in loss of bees and has a good, pro-

lific queen, the bees will commence working as soon as the tree buds swell. At this time the colony should be examined to see whether the queen has survived the winter and whether a good supply of food is on hand. When a colony is found to be queenless, it may be united with a normal one by setting the hive, minus the bottom board, over the one with the queen, with a sheet of newspaper between the two hives. In about twenty-four hours the bees will have gnawed thru the paper and by this time they will have become acquainted and no trouble will follow. In case a queenless colony seems very strong it may be left to raise its own queen, by adding to it a frame of brood containing eggs and young larvae taken from the best colony.

Small colonies which have young, prolific queens may be built up by transferring from the strong colonies frames of brood with adhering bees. The young bees will remain, the old bees will return to their former hives and the emerging brood will help to replenish the colony. Very weak colonies are undesirable and should be united with strong colonies. *Two weak colonies should never be united.*

In uniting colonies or transferring frames of brood with adhering bees, an important fact should be considered. Every colony has a distinctive odor and by this means bees of one colony recognize the bees from another and usually resent them. This can be easily overcome by smoking each colony before uniting.

All drone comb in the brood-chamber should be removed, as it is a decided hindrance to rapid brood-rearing. Patches of drone comb may be cut out and comb foundation the exact size of the piece removed inserted in its place.

Colonies that have come thru the winter with an insufficient amount of stores for brood-rearing in the spring, may be fed a thin sugar syrup made in the proportion of one part of sugar to two parts of water by volume. Feed a few pounds a day. Supers of honey from the previous season may be placed on top of the brood-chamber to provide the necessary food for brood-rearing.

Swarm Control. The greatest yield from a colony results from keeping the working forces together during the honey flow and not from an increase by swarming. It is a good practis to select certain colonies for increase and prevent swarming or

Fig. 6—An apiary with log "gums" such as are often seen in the mountain sections.

Fig. 7—An apiary with movable-frame hives.
(By courtesy of H. Garman, Kentucky Experiment Station.)

division of the working force in the others. The colonies that have been selected for honey production should start brood-rearing early and at least six weeks before the honey flow and then keep their working force intact.

Swarming may be reduced: (1) By providing sufficient room in the brood-chamber by removing some of the heaviest combs of honey, replacing them with empty ones, or exchanging frames of brood for empty combs in the weak colonies. Additional room may be provided early in the spring by placing on top of the brood-chamber either a shallow extracting-super or an extra hive-body containing frames of drawn comb; (2) By avoiding overheating of the colony by giving wide entrance and raising the hive at the back about an inch from the bottom board; (3) By going thru the hive every week when the swarming instinct is prevailing and cutting out all the queen cells; (4) By the introduction of a young queen reared from a colony not having a tendency to swarm.

Some beekeepers follow Demaree's plan in swarm control. Just before the swarming instinct prevails, put into an extra hive-body all the brood except one frame containing the last brood, with the queen and adhering bees. Fill the remaining space in each hive with frames containing full sheets of comb foundation. Set the hive containing the brood on top of the one now holding the one frame of brood and queen. Between the two hives place a queen-excluder. Go thru the upper story a week later and destroy all queen cells. As the brood hatches in this story the combs will be filled with honey making them extracting combs.

Hiving a Swarm. When the swarm issues, the old hive should be removed to a new location and a new hive containing frames with full sheets of foundation, put into its place. Exchange a frame of brood from the old or parent colony for an empty frame of the new hive. This frame of brood will usually prevent the swarm from deserting the new hive. Shake the swarm at the entrance of the new hive on the old location and transfer the supers from the parent colony to the swarm. The bees that have issued with the swarm have the storing instinct and will continue storing in the supers while the foundation in the brood frames is being drawn out in preparation for brood rearing. After the old hive is removed to the new location

all queen cells but one should be cut out, to prevent after-swarms.

On the other hand if no increase is desired, the parent colony is placed beside the swarm, with entrance in the same direction. Keep all queen cells cut out and one week later, when the bees are in the field, remove the parent colony and scatter the brood among the other colonies. The returning field bees will enter the new hive, since both colonies have apparently been on one stand.

The wings of all queens, except the virgins, should be clipped, to prevent losing the swarm and in order to keep a record as to which are old and which are young queens. When the swarm issues, the clipped queen can be found on the ground near the entrance of the hive. She is put into a queen cage, which is placed at the entrance of the hive; when the bees have started going into the hive, she is released and allowed to go in with them. In clipping a queen, gently grasp her by the waist or thorax and, with fine-pointed scissors, clip the ends of the two wings on one side. After this is accomplished, gently place her on the frames where she will crawl down among the bees.

Fall Feeding and Wintering

In sections where the winters are long and severe, as is sometimes the case in Kentucky, and when brood-rearing is suspended for several months, the colony should go into the winter with plenty of stores and some kind of protection from the cold weather. Much of the loss during the winter months comes from one of three causes, viz.: Lack of sufficient food, lack of winter protection or lack of enough young bees to go thru the winter.

Feeding. At the approach of winter every colony should be lifted to ascertain the amount of stores. A 10-frame colony, to have sufficient stores, should weigh between fifty and sixty pounds and should contain at least thirty pounds of honey. If this amount is lacking, honey or a sugar syrup should be fed. *Honey from some unknown source should never be fed*, on ac-

count of danger of introducing diseases. Syrup made from granulated sugar and water is the best substitute. A strong colony will need more stores than a weak one; in either case, a syrup made of two parts of sugar and one of water, by measure, should be used. Stir the sugar into the warm water until dissolved and in no case cook the syrup directly over a hot fire, because of the danger of scorching.

A simple feeder can be made by using a tin pan containing excelsior or grass. The pan is placed on top of the frames in an empty super and the syrup poured over the excelsior or grass. Lean pieces of wood on the pan so the bees can crawl up to it and spill a little of the syrup on the pieces and over the frames to attract the bees. Feeding should be done late in the day, to avoid robbing. It is desirable that bees have plenty of stores given them a month before they go into their winter nest.

Wintering. In wintering out-of-doors the colony should be packed in a large box, allowing for packing space four inches beneath the hive, six on the sides and ten on top. Any loose packing material, such as excelsior, planer-shavings, dried forest leaves or straw containing considerable chaff, can be used. Dry forest leaves are one of the best insulators and are easily obtained. An empty super, placed on top of the brood-chamber with the inner cover between, is filled with leaves. Many beekeepers place a shallow or full-depth super of honey over the brood-chamber. From the hive entrance to the outside of the packing case a tunnel may be constructed of two boards held apart by 3/8 inch cleats. Four 3/8 inch auger holes are bored thru the packing case to the tunnel and these may be reduced to two in extreme weather. In using the tunnel adequate packing should be provided. A poorly packed colony will not be able to carry out the dead bees, the tunnel will become clogged and the colony suffocated.

A large packing case holding four colonies can be constructed on the same plan as that used for a single hive. Two hives are placed side by side and back to back with two others

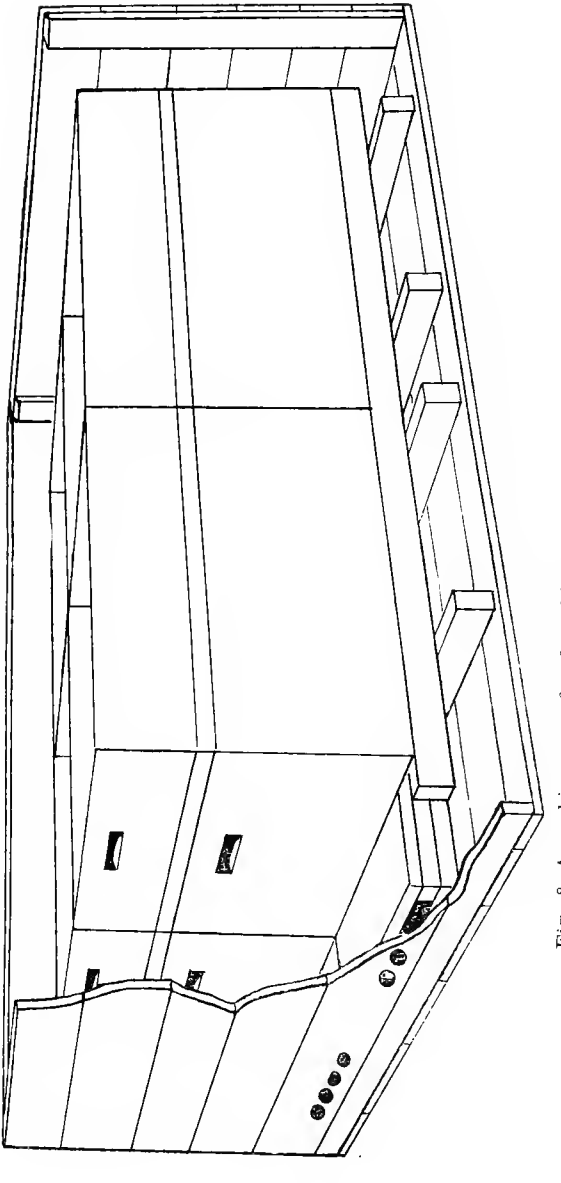

Fig. 8—A packing case for four hives, with top and side removed.

also placed side by side. These cases may be constructed so that they can be taken apart and stored away to use again.

The packing should not be removed until after the last killing frost in the spring, or until it becomes necessary to handle the combs.

Young Bees. It is very important to have a vigorous queen so that brood-rearing can continue in the fall, in order to have a strong colony of young bees. With an old queen and where brood rearing has ceased long before fall, the colony will consist of old bees which die out rapidly before spring.

Diseases

The diseases which attack the colony and cause great loss to the beekeeper are the American foul-brood and European foul-brood. These are bacterial in nature and destroy the brood, while the adults are not affected. These diseases may be carried from one hive to another either by the adult worker bees or by the operator, in honey or in combs transferred from one hive to another.

American Foul-Brood. This disease affects both larvae and pupae in open and capped cells. The capping of the cells containing the diseased larvae and pupae becomes sunken and perforated. The color turns yellow, later brownish and the odor becomes very offensive, resembling cooking glue. A ropy condition of the larvae is often the chief characteristic used by beekeepers in diagnosing the disease. The disease may be eradicated by shaking the affected colony into clean hives containing frames with narrow strips of foundation. Destroy diseased combs, frames and honey by burning. Sprinkle the inside of the hive body with kerosene, light it and let burn a few minutes until the wood begins to char; then smother the flames.

European Foul-Brood. The European foul-brood is more noticeable in the spring and early summer and is usually present in weak colonies. The dead larvae are scattered; a small percentage die after capping; the sunken and perforated cappings are less evident; the odor is not as offensive as in Amer-

ican foul-brood and the ropy condition is not frequently found. The larvae have a slightly yellow or gray color, appearing opaque and segmented.

In control of diseased colonies use the Demaree plan of swarm-prevention described in the text. As a preventive, use resistant stock, vigorous Italian Queens, and keep the colony strong. Refer to Experiment Station Circular No. 17.

The Bee Moth. The bee moth is one of the most serious enemies to success in beekeeping. The moth lays its eggs in cracks in and around the hive and the larvae tunnel thru the wax, spinning a web after them which ruins the combs. To prevent serious injury, use good hives, keep the Italian strain of bees and keep the colonies strong. To treat supers containing infected combs, pile one on top of another and in an empty one on top, place a saucer containing carbon bisulphid. Confine the fumes for a couple of days and repeat the fumigation two weeks later. It is a common practis, at the end of the season, to place lightly-infected supers and combs on top of the strongest colonies, to be cleared by the bees. The treated combs should be stored in a tight room where no adult moths can get in to reinfest them.

Sources of Honey

Fruit trees and *bush fruits* are of considerable importance and furnish both pollen and nectar. If the weather is not too cold and the bees are able to gather the nectar, there is often some surplus honey stored.

Crimson clover is a very important plant, as it fills a gap between the fruit blossoms and while clover, coming into bloom soon after the apple blossoms. The honey is of a very light yellow color and its quality compares well with that from the other clovers.

Alsike clover will grow on land where red clover will not do well and, planted with other grasses, makes a good hay crop. The honey is of excellent quality, of light, rich-yellow color and the yield compares well with that from white clover.

White clover produces a delicious, white honey, of the finest quality, which is considered one of the best for table use. It usually yields a heavy surplus, but in unfavorable seasons the plant secretes nectar in limited quantities and the surplus is very light.

Red clover secretes an abundance of nectar but the flower tubes are too long for the honey bees to get the nectar; in times of drouth, however, or in the second growth the tubes are shorter and it is then sometimes worked by the bees.

Sweet clover is one of the most important honey plants, since it furnishes nectar for a long time, while the honey is of light color and excellent flavor, suggestive of vanilla. It flowers after white and alsike clovers, comes into bloom when the colonies are strong and continues blooming thru a period of four weeks or more.

It does not pay to cultivate the plant for nectar alone, but beekeepers who have become interested in the plant are sowing it along the roadside and waste places, sowing a mixture of the white and yellow species. The yellow species will bloom about two weeks before the white.

Sour wood produces a clear honey, of excellent quality, which does not candy. It, together with the linden, is one of the principal honey plants in the mountain sections and yields nectar in large quantities.

Buckwheat is an important honey plant, producing pollen and nectar in large quantities, and comes at the time when there is a dearth in the honey flow of other plants. The honey is dark, of heavy body and strong flavor.

Goldenrod yields an abundance of nectar and the honey has a golden or dark amber color, with a strong flavor when first stored, but after having been well ripened the flavor becomes rich and pleasant.

Aster produces a white honey, but this often becomes mixt with honey from the golden rod and other fall plants, giving it an amber color. When first gathered it has a strong, rank odor, but after it is ripened the odor disappears. The honey is thick and granulates very quickly. The bees usually gather enough

in the fall from the aster and goldenrod to carry them thru the winter and, in a good season, some surplus is stored.

Honeydew is a secretion from aphids or plant lice and scale insects. Many of our forest trees, such as the elm, hickory and sycamore, are frequently infested with aphids, or plant lice, which yield large quantities of honeydew. Often the leaves of these trees become covered with this glistening secretion dropped by the insects higher up on the leaves and branches.

Honeydew honey has a dark, cloudy color and the quality is very poor. This honey is not easily digested and causes dysentery, when fed to bees.

Uses and Care of Honey

Honey is the most wholesome of sweets and is frequently prescribed by physicians for their patients where other sweets such as sugar and corn syrup cannot be eaten. It has excellent medicinal qualities and is used in the dressing of wounds. Confectioners use it in sweetening soft drinks and in ice creams. It is used by bakers and biscuit manufacturers in their cookies and cakes which, because of its presence, will keep moist and palatable for a long time. Large quantities of the cheaper grades of honey are used in canning fruits and making preserves.

Honey should be kept in a dry, warm place where the temperature is around 70 degrees F. Honey that has granulated can be liquefied by heating it for a short time at a temperature of 160 degrees F. and then putting away while hot in a tight container.

Final Recommendations

Give the bees systematic attention.

Keep bees in movable-frame hives instead of the box hives or "gums."

Keep down the weeds and grass in the apiary.

Provide the bees in the spring with plenty of stores and room for brood rearing.

Keep certain colonies for honey production, others for increase.

Prevent division of colony during honey flow, because it reduces the honey crop.

Operate the apiary for "chunk" comb honey or extracted honey. The production of section honey requires skill in management and a rapid honey-flow.

Keep the colonies strong by using young, vigorous queens.

Give the colonies ample stores for the winter and protection from the cold.

Treat diseased colonies as soon as they are discovered.

Read the bee magazines and keep abreast of the times.

Become a member of a beekeepers' organization.

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Wilson & Wilson, 206 E. Market St., Louisville, Ky.
(Successors to J. P. Martine & Son.)

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